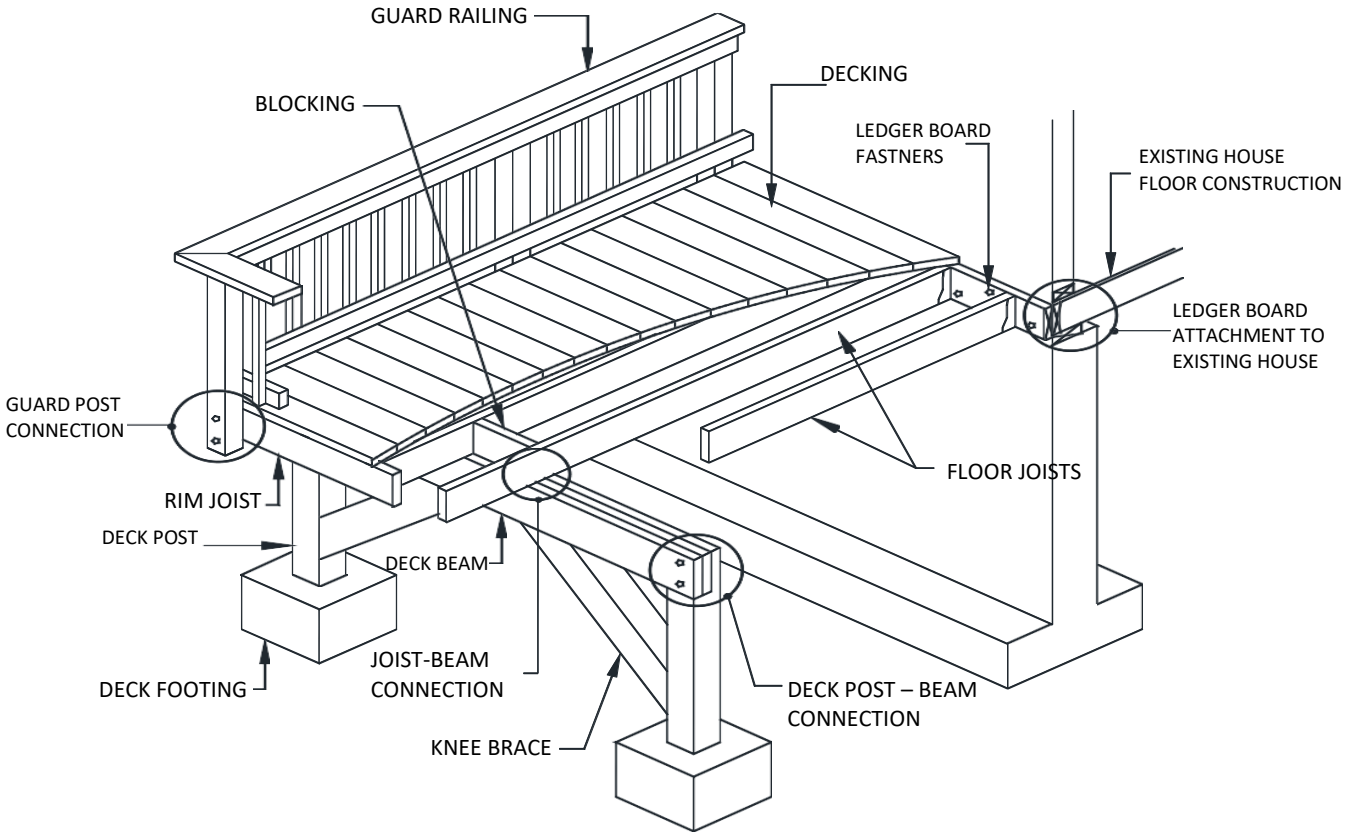
Nelson County, Virginia

Typical Deck Details

Based on the 2015 Virginia Residential Code

The design details in this document apply to residential decks only. Framing requirements are limited to single span, single level decks, and construction must not deviate from the details in this packet for it to be used and the deck details shown here in this packet are the only County pre-approved ones. A copy of your Red Stamped county approved plans must be on the job site and available during each required inspection. Failure to post the permit placard so that it is visible from the road and have plans on site may result in an automatic failed inspection.

Typical Deck Details



All residential decks constructed in Nelson County must comply with the 2015 Virginia Residential Code (VRC). This guide is for general assistance. Any specific questions and / or concerns must be addressed on **your submitted construction drawings**. Submitted construction drawings will be reviewed for code compliance.

Once approved, the laminated permit placard must be posted clearly to be seen from the road and one copy of the **red stamped** approved plans must remain on the work site at all times for all inspections. .

To apply for a deck building permit, you will need to submit:

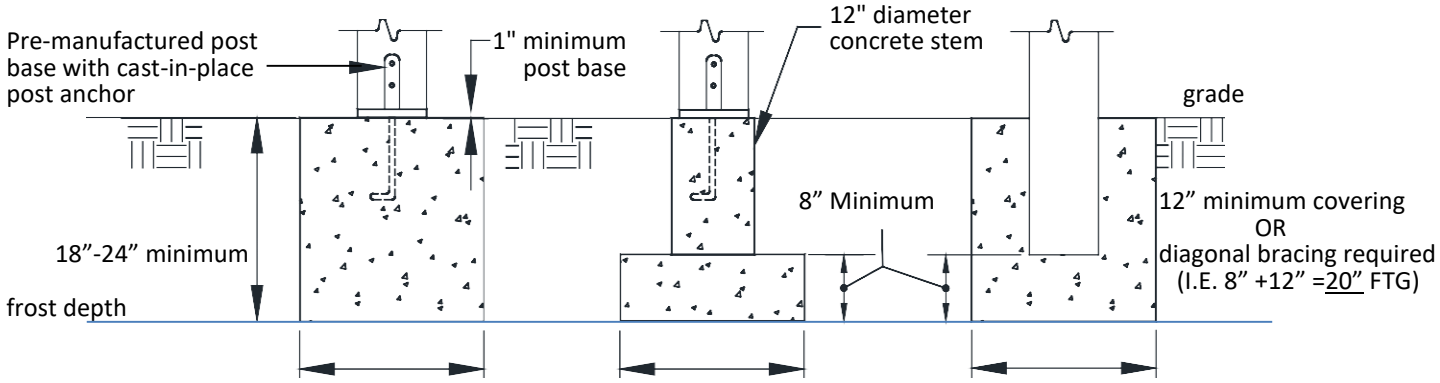
- Building Permit Application – completely filled out
- Two sets of construction drawings with full details, or this packet may be used with last page filled out
- Two copies with the deck drawn in of your recorded plat or a copy of the GIS plat
- Supply building contractor information or the signed affidavit if you are building it yourself.

The following information is provided for your assistance in preparing your construction drawings for review and approval by this office. Any questions may be addressed by calling our office at 434-263-7080.

FOOTINGS

Footings shall be constructed in accordance with the requirements below:

- Footings shall bear on original solid ground – not backfill, unless it is engineered fill.
- Grade for frost protection is minimum 18” on the East side of Route 151 (Lovingston side) and minimum 24” on the West side of Route 151 (Stoney Creek Side).
- Ground bearing conditions must be verified by the building inspector prior to placement of concrete.
- The size of footings supporting piers and columns shall be based on the tributary load. 1500 PSF load bearing pressure is assumed for all footings unless there is a stamped geotechnical engineer report or field verifiable using Table **R401.4.1**.
- The footing details below are an illustration of the three types of pier footings that are pre-approved. Please show which type of footing will be used.



TYPE: **[A]** **[B]** **[C]**

FOOTING SIZE (a) (c) (d)			
TRIBUTARY AREA (b) (SQ FT)	SQUARE FOOTING SIDE DIMENSION (INCHES)	ROUND FOOTING DIAMETER (INCHES)	THICKNESS (INCHES)
20	12	14	8
30	12	14	8
40	14	16	8
50	16	18	8
60	17	19	8
70	18	20	8
80	20	22	8
100	22	25	8
120	24	27	9
140	26	29	10
160	28	31	11

a. ASSUMES 1500 PSF SOIL BEARING CAPACITY

b. *TRIBUTARY AREA* IS DEFINED AS THE AREA INSCRIBED BY ONE HALF THE LENGTH OF THE SPANS ADJACENT TO ALL FOUR SIDES SURROUNDING THE POST.

TRIBUTARY AREA =

(1/2 JOIST SPAN + JOIST CANTILEVER) X (1/2 BEAM SPAN + BEAM CANTILEVER)

c. THE FOOTING SIZES IN THIS TABLE ASSUMES NO ROOF LOAD. IF THE FOOTING SUPPORTS A PORCH ROOF, **ADD 4"** TO THE ABOVE FOOTING DIMENSIONS FROM THIS TABLE.

d. INTERPOLATION IS PERMITTED BUT SIZES MUST BE ROUNDED TO NEXT LARGER INCH.

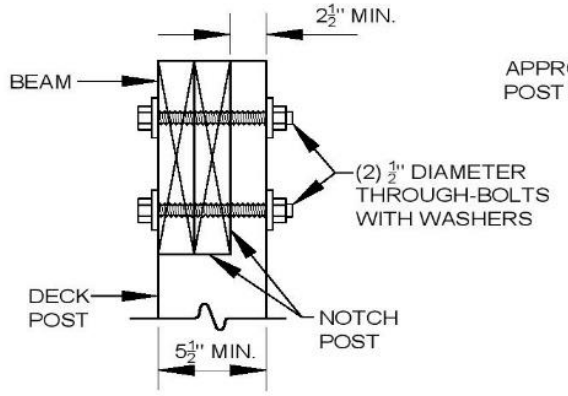
POSTS

Posts and post connections shall meet the requirements listed below:

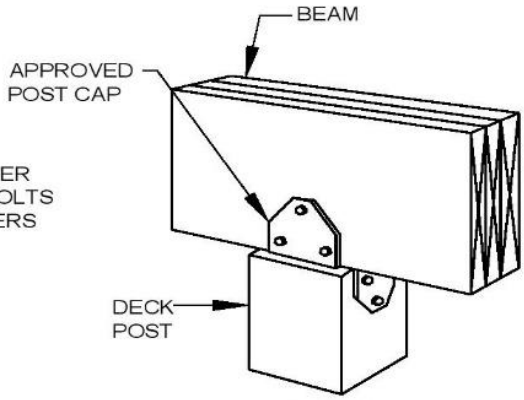
- Refer to Table **R507.8** for post sizing based on height from grade to underside of deck beam. **Posts that are over listed heights require an engineered design.**
- Per **R507.8.1**, Posts shall be restrained from lateral is placement at the footing. Lateral restraint shall be provided by manufactured connectors or by **minimum post embedment of 12 inches** in surrounding soils or concrete piers.
- Deck beam to deck post shall be connected together either by a post cap or by a notched post to accommodate **ALL PLIES** of the deck beam and bolted together in accordance with Figure **R507.7.1**.

Do not notch 4x4 posts.

TABLE R507.8: MAXIMUM POST HEIGHT	
Post Size	Maximum Height
4x4	8'-0"
4x6	8'-0"
6x6	14'-0"

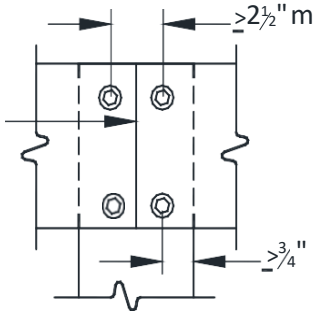


NOTCHED POST



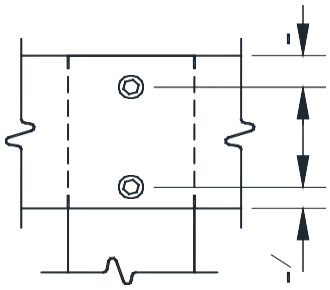
POST CAP

BEAM WITH MEMBERS SPLIT & CENTERED ON POST NOTCH (4 BOLTS REQUIRED)



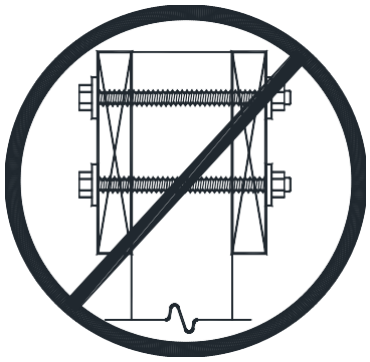
6x6 post

POST AT BEAM SPLICE



WHEN BEAM MEMBERS ARE NOT SPLIT ON POST (2 BOLTS REQUIRED)

TYPICAL POST



PROHIBITED CONNECTION

6x6 POST-TO-BEAM CONNECTIONS

LEDGER CONNECTION TO HOUSE

Below are the general requirements for ledger boards that are positively connected to the house. Code compliance is critical to ensure the safety and structural stability of the deck. Ledger connections are the leading cause of deck failure.

- Ledger boards **shall not** be supported on stone or masonry veneer **(R507.2.2)**.
- The ledger board shall be attached in accordance with Table **R507.2**, **Table R507.2.1**, and **Figure R507.2.1 (1)**.
- Deck ledger shall be a minimum of 2x8 pressure-preservative treated No.2 grade lumber.
- The ends of each joist and beam shall have not less than $1^1/_2$ inches (38 mm) of bearing on wood or metal and not less than 3 inches (76 mm) on concrete or masonry for the entire width of the beam. 2x2 ledger strips are **not** permissible. **(R507.7)**
- It is imperative that we determine what the ledger will be fastened to. If this cannot be verified, the deck shall be a self-supporting structure **(R507.2.1 (1)**.

TABLE R507.2: FASTENER SPACING FOR A SOUTHERN PINE OR HEM-FIR DECK LEDGER

JOIST SPAN	6' and less	6'1" to 8'	8'1" to 10'	10'1" to 12'	12'1 to 14'	14'1" to 16'	16'1" to 18'
Connection Details	**On-center spacing of fasteners**						
1/2" diameter lag screw with 15/32" maximum sheathing	30	23	18	15	13	11	10
1/2" diameter bolt with 15/32" maximum sheathing	36	36	34	29	24	21	19
1/2" diameter bolt with 15/32" maximum sheathing and 1/2" stacked washers	36	36	29	24	21	18	16

TABLE 507.2.1
PLACEMENT OF LAG SCREWS AND BOLTS IN DECK LEDGERS AND BAND JOISTS

MINIMUM END AND EDGE DISTANCES AND SPACING BETWEEN ROWS				
	TOP EDGE	BOTTOM EDGE	ENDS	ROW SPACING
Ledger[a]	2 inches[d]	¾ inch	2 inches[b]	$1^5/_8$ inches[b]
Band Joist[c]	$^3/_4$ inch	2 inches	2 inches[b]	$1^5/_8$ inches[b]

For SI: 1 inch = 25.4 mm.
a. Lag screws or bolts shall be staggered from the top to the bottom along the horizontal run of the deck ledger in accordance with Figure R507.2.1(1).
b. Maximum 5 inches.
c. For engineered rim joists, the manufacturer's recommendations shall govern.
d. The minimum distance from bottom row of lag screws or bolts to the top edge of the ledger shall be in accordance with Figure R507.2.1(1).

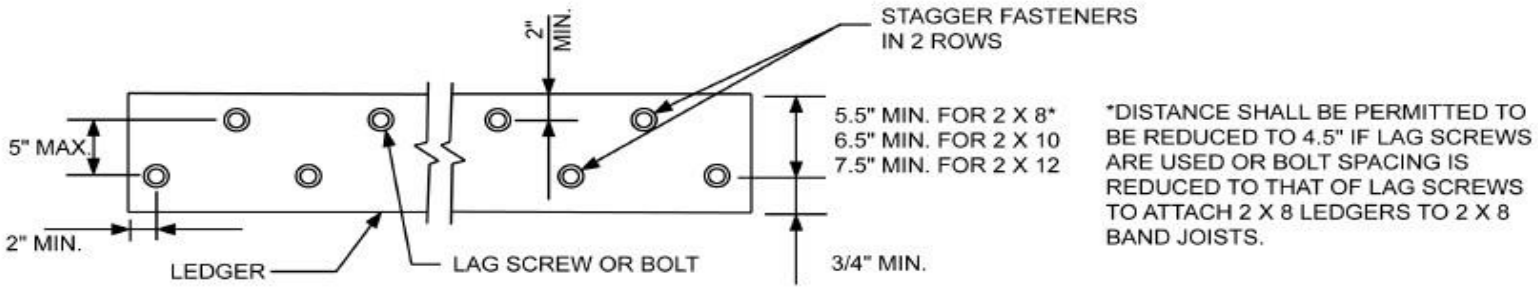


FIGURE R 507.2.2(1)

DECK LATERAL LOAD CONNECTION

R507.2.4 Deck lateral load connection.

The lateral load connection required by **Section R507.1** shall be permitted to be in accordance with **Figure R507.2.3(1)** or **R507.2.3(2).** Where the lateral load connection is provided in accordance with **Figure R507.2.3(1)**, hold-down tension devices shall be installed in not less than two locations per deck, within 24 inches of each end of the deck. Each device shall have an allowable stress design capacity of not less than 1,500 pounds (6672 N). Where the lateral load connections are provided in accordance with **Figure R507.2.3(2)**, the hold-down tension devices shall be installed in not less than four locations per deck, and each device shall have an allowable stress design capacity of not less than 750 pounds (3336 N). The four locations shall be: two within 24" of the ends of the deck and two more staggered across the width of the deck to create equal sections of the ledger board.

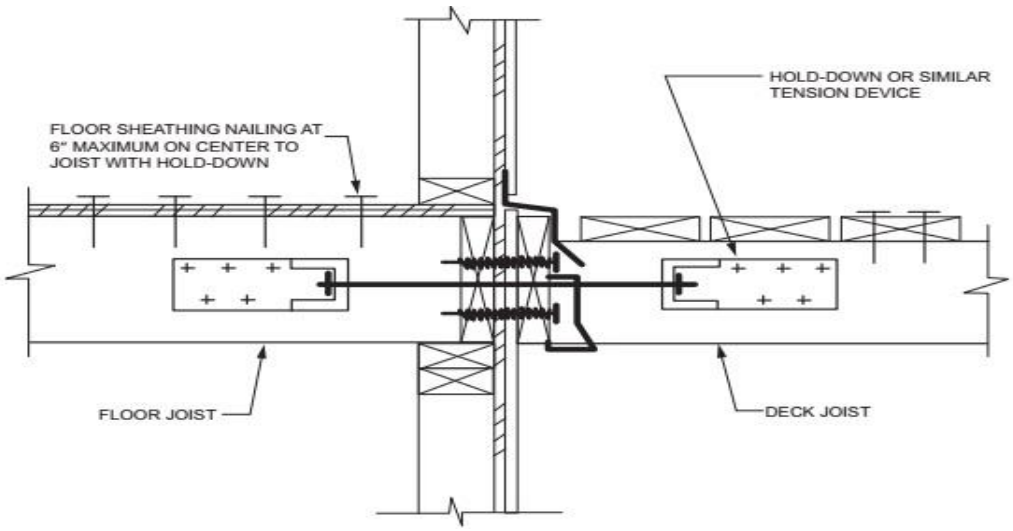


FIGURE 507.2.3(1) DECK ATTACHMENT FOR LATERAL LOADS

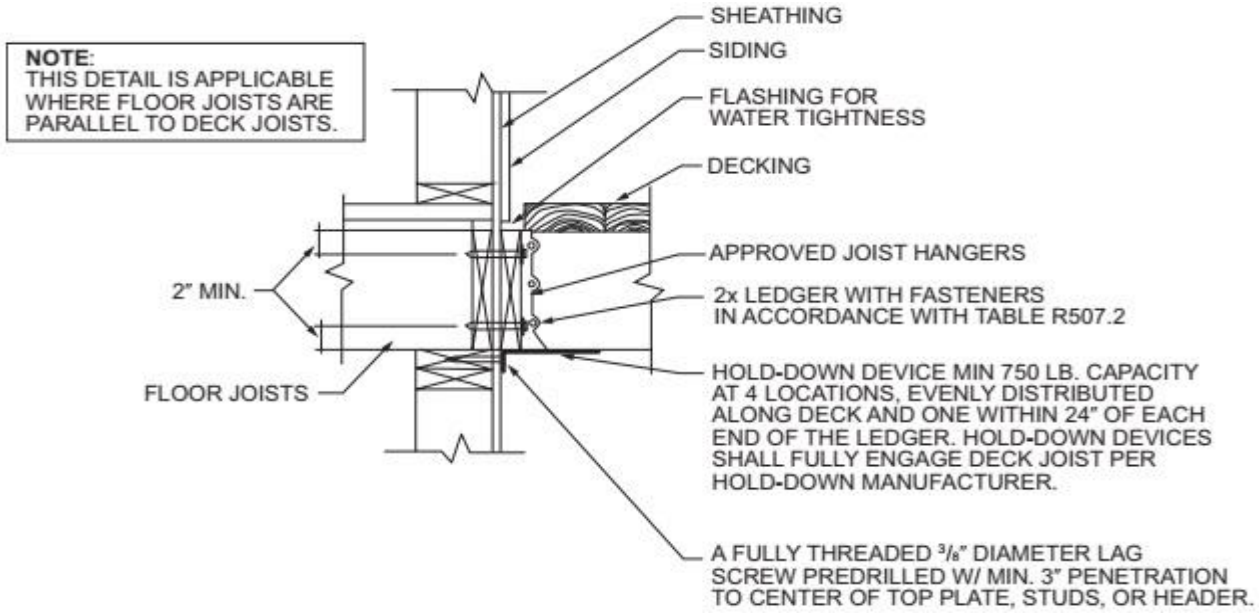


FIGURE R507.2.3(2) DECK ATTACHMENT FOR LATERAL LOADS

DECK BEAMS

Beams shall be designed and assembled in accordance with the requirements below:

- As shown in **Figure R507.6**, beam span is measured between the centerlines of the two adjacent posts and does not include the overhangs.
- Beam size is determined using **Table R507.6**. Flush beams shall be greater or equal to the joist depth.
- As shown in **Figure R507.6**, beams may overhang past the center of the post **up to one-fourth** of the actual beam span.
- Beam plies shall be fastened with two rows of 10d nails minimum of 16 inches on center along each edge. This is for up to 3 plies. If beam exceeds 3 plies, an engineered design is required for attachment of all plies.
- Each beam member must be supported by minimum of 2 posts.
- Deck beams with splices shall be located at an interior post location and centered over posts.

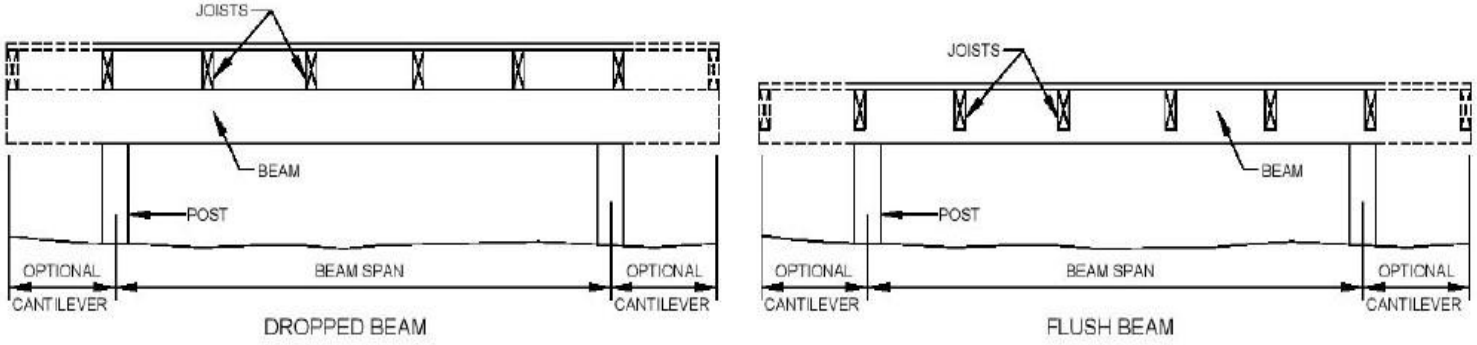


FIGURE R507.6
TYPICAL DECK BEAM SPANS

TABLE R507.6
DECK BEAM SPAN[a] LENGTHS[b,c]

SPECIES[d]	SIZE[e]	DECK JOIST SPAN (feet) LESS THAN OR EQUAL TO:						
		6	8	10	12	14	16	18
Southern pine	2-2x6	6-11	5-11	5-4	4-10	4-6	4-3	4-0
	2-2x8	8-9	7-7	6-9	6-2	5-9	5-4	5-0
	2-2x10	10-4	9-0	8-0	7-4	6-9	6-4	6-0
	2-2x12	12-2	10-7	9-5	8-7	8-0	7-6	7-0
	3-2x6	8-2	7-5	6-8	6-1	5-8	5-3	5-0
	3-2x8	10-10	9-6	8-6	7-9	7-2	6-8	6-4
	3-2x10	13-0	11-3	10-0	9-2	8-6	7-11	7-6
	3-2x12	15-3	13-3	11-10	10-9	10-0	9-4	8-10
Douglas fir-larch[f], hem-fir[f], spruce-pine-fir[f], redwood, western cedars, ponderosa pine[g], red pine[g]	3x6 or 2-2x6	5-5	4-8	4-2	3-10	3-6	3-1	2-9
	3x8 or 2-2x8	6-10	5-11	5-4	4-10	4-6	4-1	3-8
	3x10 or 2-2x10	8-4	7-3	6-6	5-11	5-6	5-1	4-8
	3x12 or 2-2x12	9-8	8-5	7-6	6-10	6-4	5-11	5-7
	4x6	6-5	5-6	4-11	4-6	4-2	3-11	3-8
	4x8	8-5	7-3	6-6	5-11	5-6	5-2	4-10
	4x10	9-11	8-7	7-8	7-0	6-6	6-1	5-8
	4x12	11-5	9-11	8-10	8-1	7-6	7-0	6-7
	3-2x6	7-4	6-8	6-0	5-6	5-1	4-9	4-6
	3-2x8	9-8	8-6	7-7	6-11	6-5	6-0	5-8
	3-2x10	12-0	10-5	9-4	8-6	7-10	7-4	6-11
	3-2x12	13-11	12-1	10-9	9-10	9-1	8-6	8-1

DECK JOISTS

Deck joists shall be designed in accordance with the requirements below:

- Joist span is measured from centerline of bearing at each joist end and does not include the overhangs. Use **Table R507.5** to determine joist size as well as allowable cantilever lengths up to one-fourth of the joist span.
- Refer to **Figure R507.5** for typical joist span details.
- Deck joists shall be fully supported by either sitting on the entire deck beam width or by using joist hangers with bottom support.

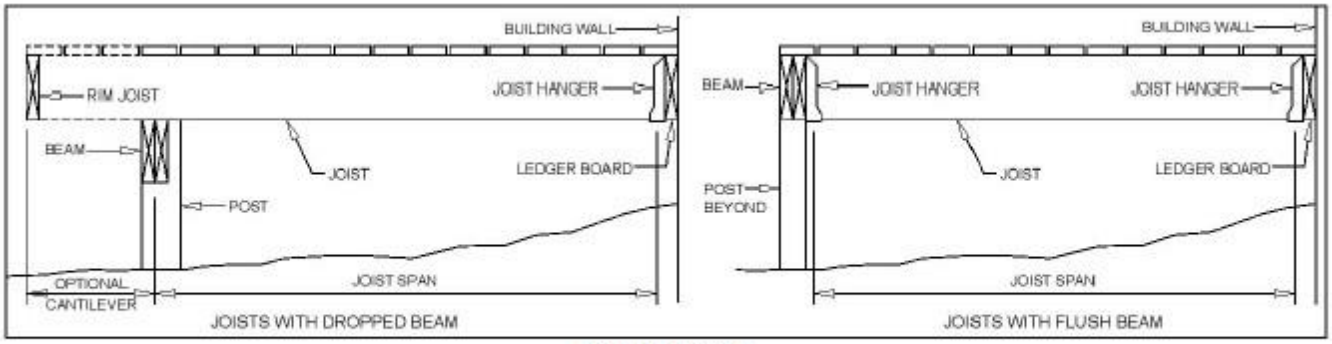


FIGURE R507.5
TYPICAL DECK JOIST SPANS

DECK JOIST SPANS FOR COMMON LUMBER (ft. – in.)

Maximum allowable spans for wood deck joists shall be in accordance with the Table R507.5 below. Deck joists shall be permitted to cantilever not greater than one-fourth of the actual, adjacent joist span. The joists' design is based on spacing, size, and span length. Use TABLE 2 to determine joist size and the corresponding maximum allowable overhang.

Note: the overhang dimension shall never exceed one-fourth of the actual joist span.

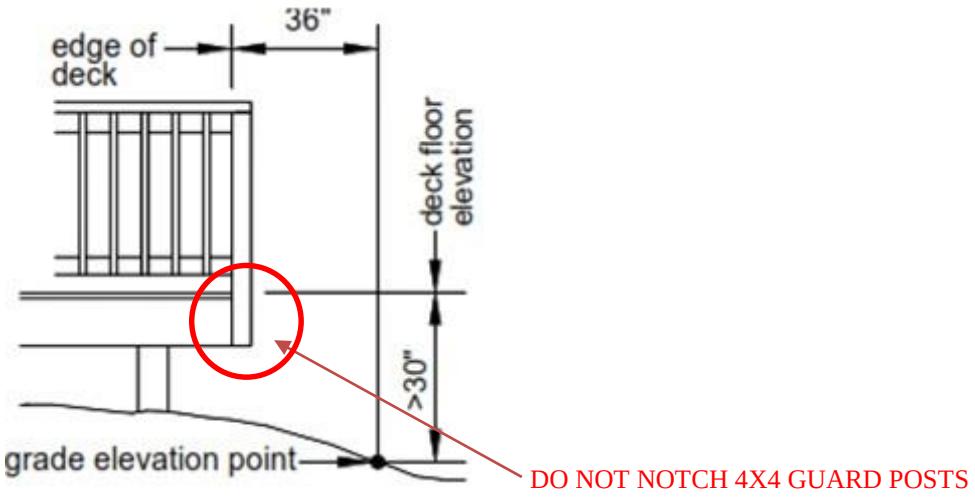
TABLE 2: MAXIMUM JOIST SPAN LENGTH

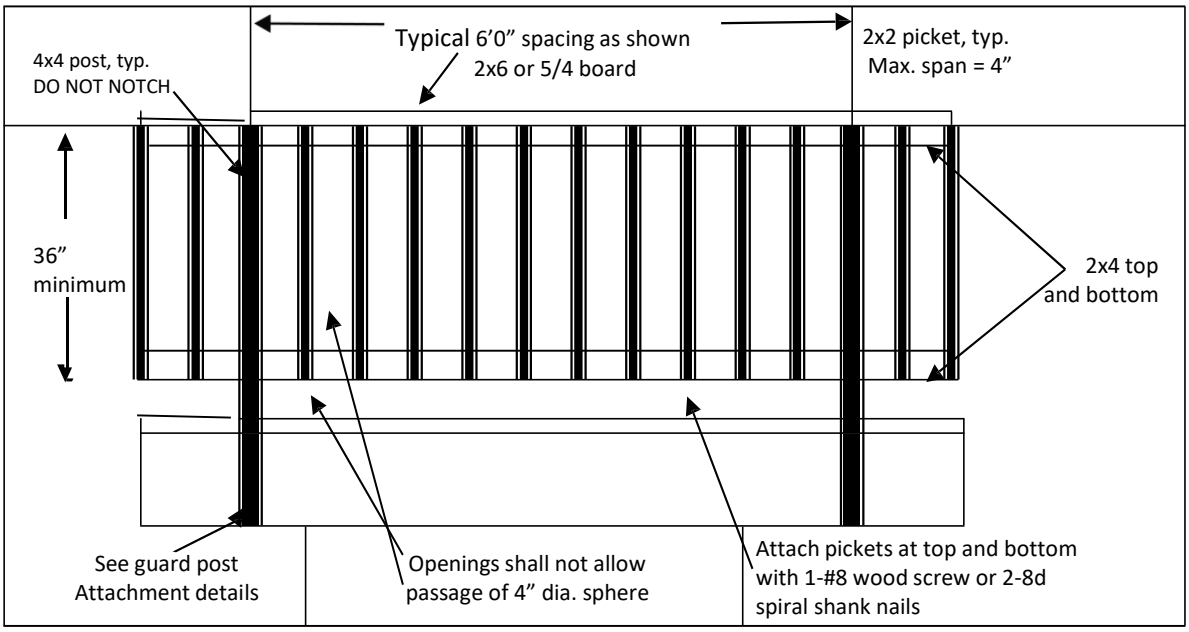
Joist Spacing (inches on center)	Joist Size	Allowable Span	Allowable Overhang$_1$
12	2x6	9'-11"	1'-3"
	2x8	13'-1"	2'-1"
	2x10	16'-2"	3'-4"
	2x12	18'0"	4'-6"
16	2x6	9'-0"	1'-4"
	2x8	11'-10"	2'-3"
	2x10	14'-0"	3'-6"
	2x12	16'-6"	4'-2"
24	2x6	7'-7"	1'-6"
	2x8	9'-8"	2'-5"
	2x10	11'-5"	2'-10"
	2x12	13'-6"	3'-4"

GUARDS

Guarding shall be installed in accordance with the requirements below:

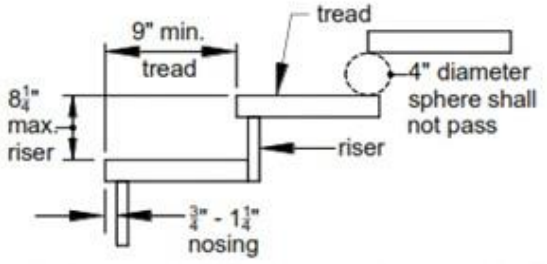
- Guarding is required at decks that are constructed at a height 30” or greater, measured from top of the walking surface to grade. **See illustration below**.
- Height of guarding shall be 36” measured vertically from the top of the walking surface to top of the railing.
- There shall be no openings that will allow a passage of a 4” sphere between them.
- Guard systems with a valid evaluation report from an accredited listing agency are permitted.
- Guardrails must withstand 200 lbs. point load in any direction and infill must withstand 50 lbs. loading over a one square foot area.





STAIRS

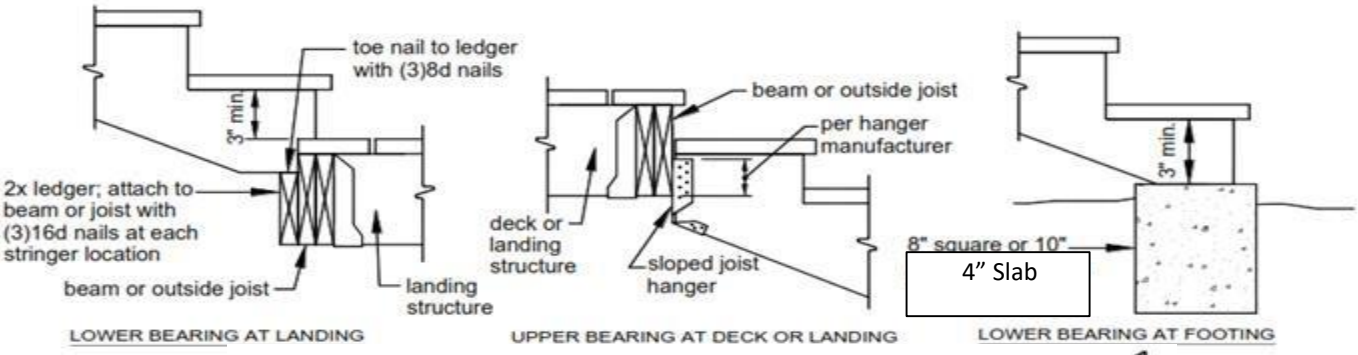
Stairs shall be constructed with the requirements below:

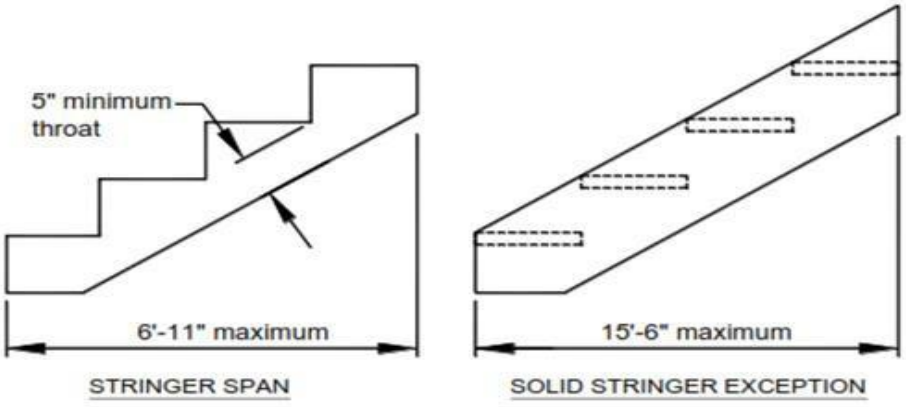


- The minimum stairway width shall be 36". **(R311.7.1)**
- Stair geometry & opening limitations shall meet the requirements as shown in the detail below per (**R311.7.5.1 & R311.7.5.2)**
- If the total vertical height of the stairway exceeds 147 inches, then a landing is required. **(R311.7.3)**
- Landing widths shall be equal to the total width(s) of the stairway(s) it serves. **(R311.7.6)**
- The triangular opening at the stair formed by the riser, tread and bottom rail of a guard, shall not allow the passage of a 6" diameter sphere. **(R312.1.3)**

Stair stringers shall be in accordance with the following requirements:

- Stringers shall be of sawn or solid 2x12's complying with the tread and riser geometry requirements.
- Stringers shall bear on footings to support a 40# live load or 300# concentrated load over 4 square inches per **R301.5**, or by the deck or landing they serve. **See examples below**.
- Stringer span length is measured using the horizontally projected distance between the centerlines of bearing at each end
- The span length of stringer shall not exceed 6 feet-11 inches, and the throat size of cut stringers shall not exceed 5 inches. **See examples below**
- The span length of a solid stringer with a width equal to 36 inches shall be permitted to have a horizontally projected span up to 15.5 feet when framed solely with two solid stringers. **See example below**.
- The minimum tread depth shall be 9″ (from nosing to nosing). The maximum rise shall be 8-1/4″. The difference between the least and greatest rise and the least and greatest tread depth within one run of stairs shall not exceed 3/8″.

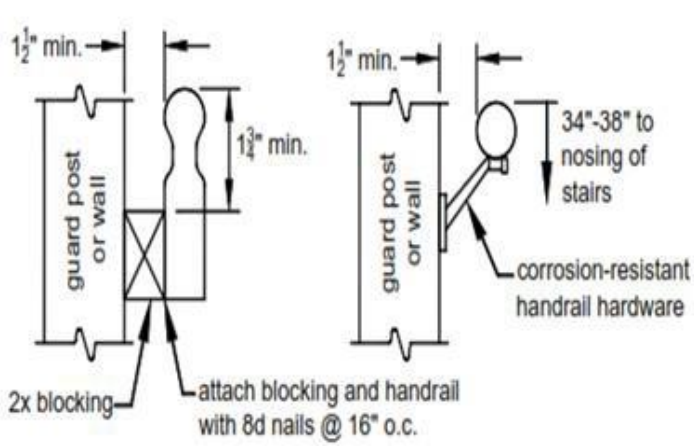


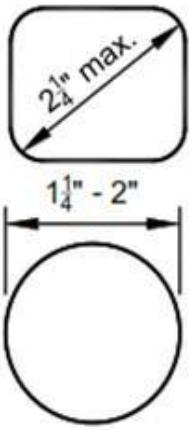


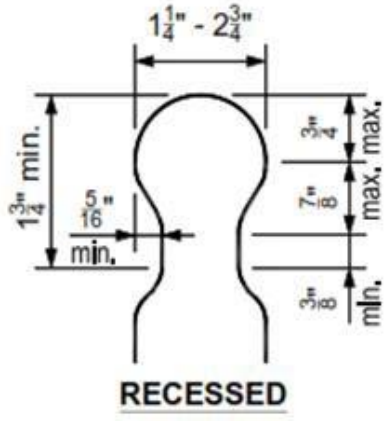
HANDRAIL

Handrails shall meet the requirements below:

- Handrails are required when there are 4 or more risers. **(R311.7.8)**
- Handrail height shall be no less than 34 inches and no more than 38 inches, measured vertically from the top of the tread nosing. **(R311.7.8.1)**
- Handrails shall be continuous for the full length of the flight of the stairs and shall be returned or terminate into a newel post or safety terminal. **(R311.7.8.2)**
- Grip size of handrail shall be in accordance with examples below or for handrails with a perimeter greater than 6- ¼" shall have a graspable finger recess area on both sides of the profile. The finger recess shall begin with a distance of ¾" measured vertically from the tallest portion of the profile and achieve a depth of at least 5/16" within 7/8" inch below the widest portion of the profile. Refer to **R311.7.8.3 Note #2.**



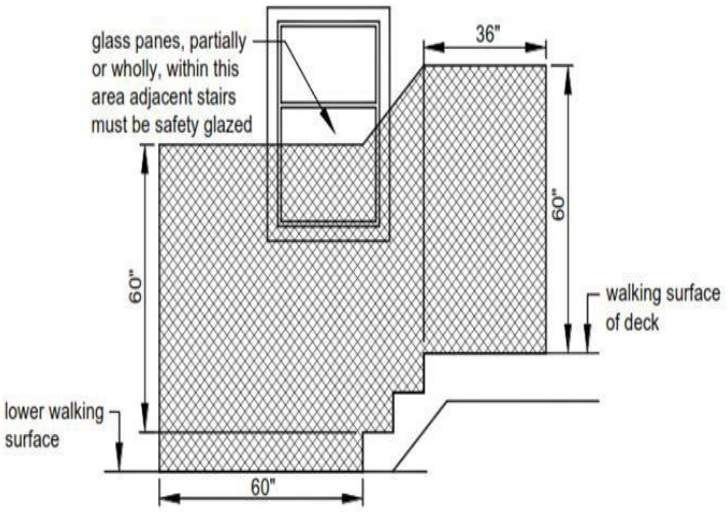




SAFETY GLAZING

- To reduce injury due to an accidental impact, safety glazing in window and door glass is required when the existing house wall encloses any portion of the deck or acts as a barrier to stairs, landings, and areas at the top and bottom of the stairs.

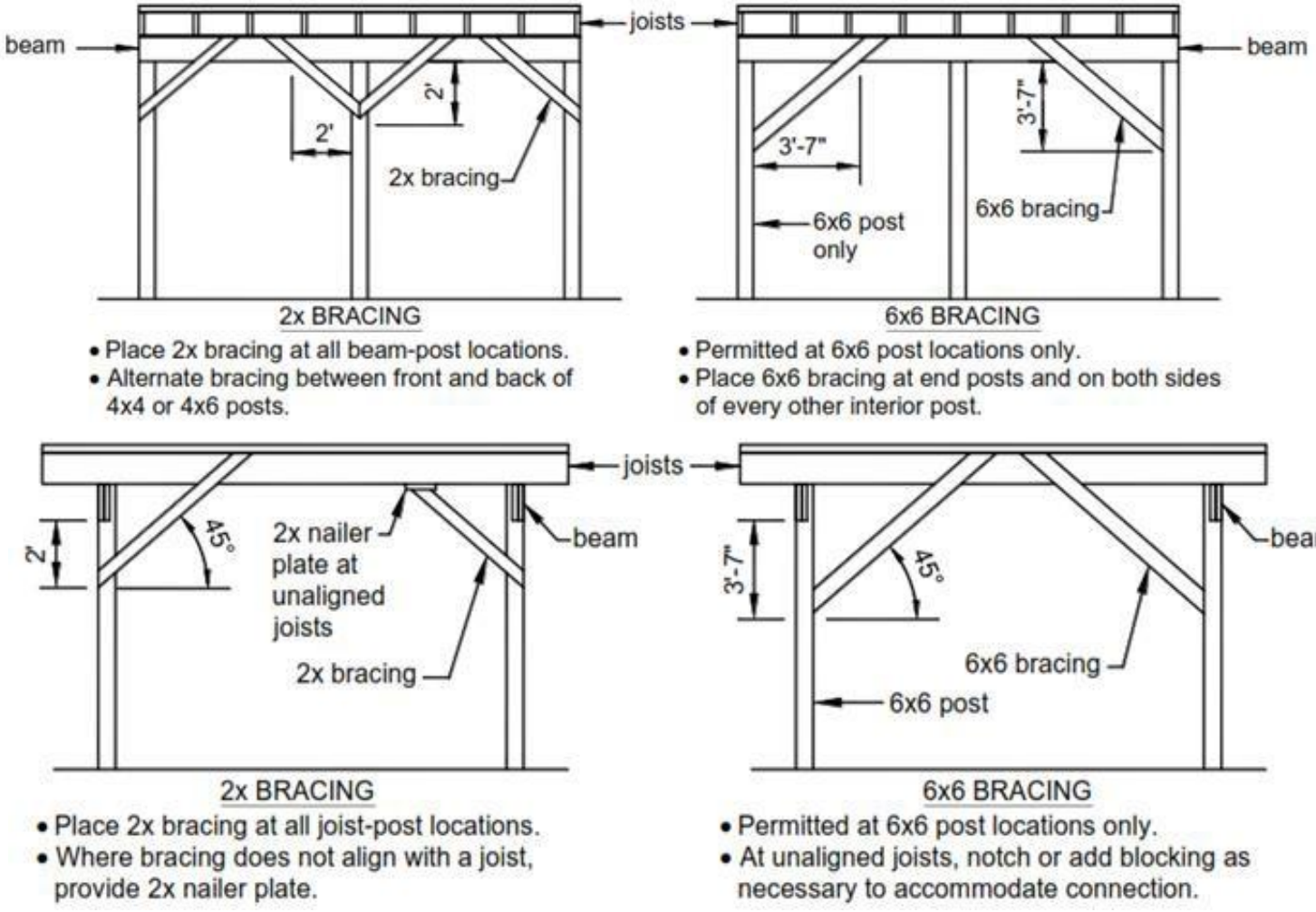
- **Windows adjacent stairway**. Individual panes, partially or wholly located in the hatched area shown in the example, must be safety-glazed. In the absence of safety glazing in a window adjacent a stairway, a stair guard must be constructed to separate the window from the stairway. In the absence of safety glazing in a window adjacent the 36-inch horizontal areas at the top or bottom of the stairs, a guard or horizontal rail must be installed at a height between 34 and 38 inches. The rail must meet the requirements of a stair handrail.



FREE-STANDING DECKS

Free-standing decks shall be in accordance with the requirements below or by an engineered design:

- Diagonal bracing shall be required for ALL decks **over 8-foot-tall** and bracing shall be installed at post-beam locations as shown in details below.
- Diagonal bracing shall be 2x members at any post size or 6x6 members at 6x6 posts only.
- Connections of the diagonal bracing shall be in accordance with **the illustrations below**.
- **<u>If free-standing deck is over 14-foot-tall, an engineered design shall be required</u>.**



2x BRACING

- Place 2x bracing at all beam-post locations.
- Alternate bracing between front and back of 4x4 or 4x6 posts.

6x6 BRACING

- Permitted at 6x6 post locations only.
- Place 6x6 bracing at end posts and on both sides of every other interior post.

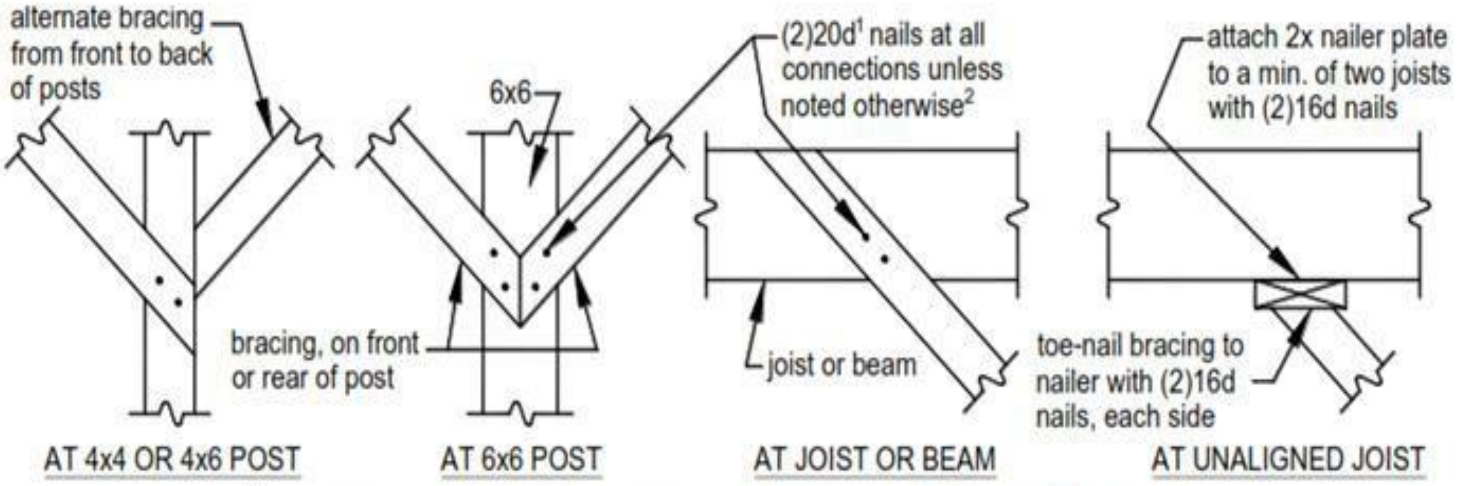
2x BRACING

- Place 2x bracing at all joist-post locations.
- Where bracing does not align with a joist, provide 2x nailer plate.

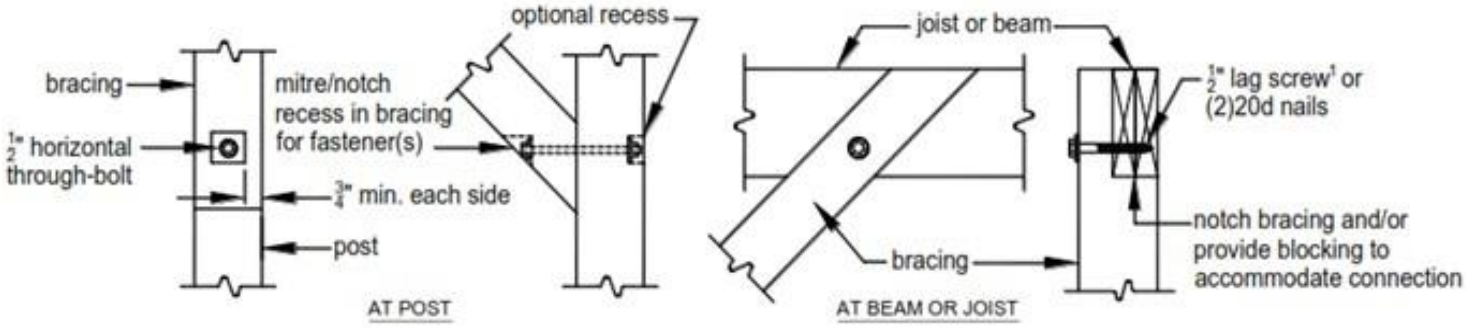
6x6 BRACING

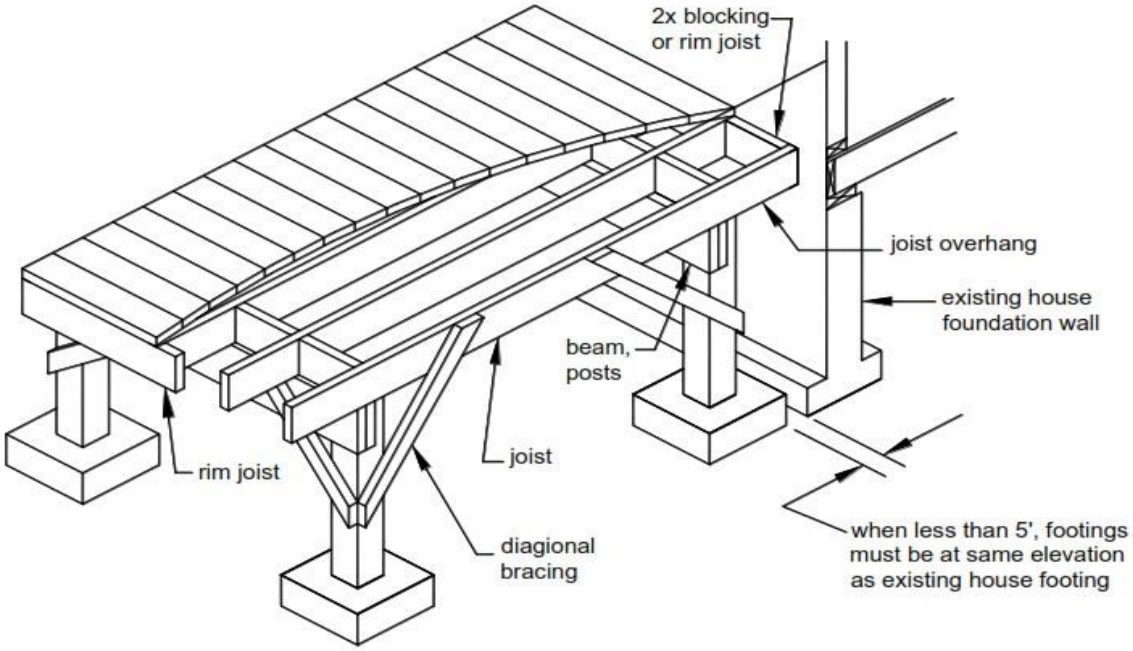
- Permitted at 6x6 post locations only.
- At unaligned joists, notch or add blocking as necessary to accommodate connection.

- **Please see more bracing examples on the next page.**



[1] Nails maybe be substituted with an equal number of the approved wood screws listed in TABLE 7.
[2] Nails shall have a distance of ⅜ inches to all edges and ⅞ inches to the end of the bracing member.





Free Standing Deck Bracing Examples

DECKING

Wood or wood plastic composite decking shall be installed in accordance with the requirements below:

- Decking shall be nominal 2-inch-thick wood, 5/4-inch-thick wood, or wood/plastic composite material. **(R507.4)**
- Wood decking may be placed at a maximum angle of 45 degrees to the joists. **(Table R507.4 sub note a).**
- Wood/plastic composite decking may be placed at an angle but in accordance with manufacturer's installations instructions. **(R507.3.1)**
- Refer to **Table R507.4** for maximum joist spacing based off the decking material that will be installed.

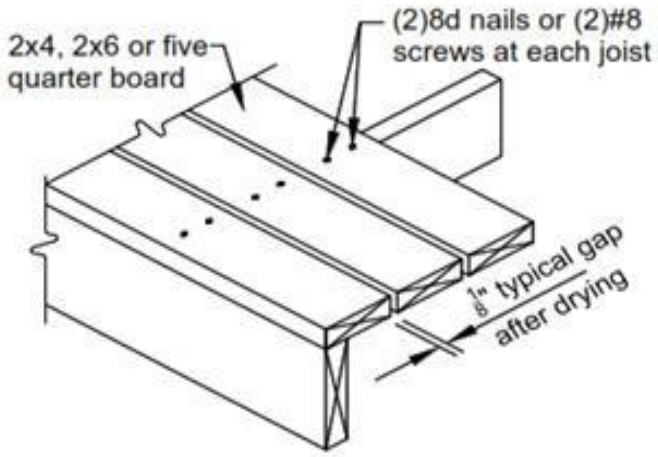


TABLE R507.4
MAXIMUM JOIST SPACING (inches)

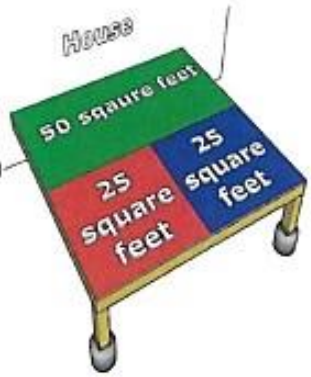
MATERIAL TYPE AND NOMINAL SIZE	MAXIMUM JOIST SPACING	
	PERPENDICULAR TO JOIST	DIAGONAL TO JOIST[a]
5/4-inch thick wood	16	12
2-inch thick wood	24	16
Wood/plastic composite	Per R507.3	Per R507.3

For SI: 1 inch = 25.4 mm

a. Maximum angle of 45 degrees from perpendicular for wood deck boards.

In order to determine the proper size for your footings you will need to establish how much total weight they are going to have to support and what kind of soil they are covering. To calculate the load you should use 40lbs per square foot live for load (these are variable loads that are dynamic such as the weight of people and furniture) and 15 lbs per square foot for dead load (this is the weight of the materials used for the construction of the deck) for a total of 55 lbs per square foot total load.

If you were building a 10x10 deck attached to a house with 2 footings on the corners you could calculate the loads for the footings in the following way. First draw a line dividing the deck into two halves between the house and the footings. The load for the section nearest the house will be transferred back to the ledger board and carried down to the house foundation. The remaining half of the deck will again be split into two parts to be supported by the two corner footings. This is called the tributary load. If you multiply the area of this section 5' x 5' you will get 25 square feet. You can multiply this area by 55 lbs per square foot loading to come up with 1375 lbs total load. Once you know the total load you can use the chart below to determine the footing size for your soil conditions.



Circular Footings

Maximum Allowable Load Per Footing, in Lbs

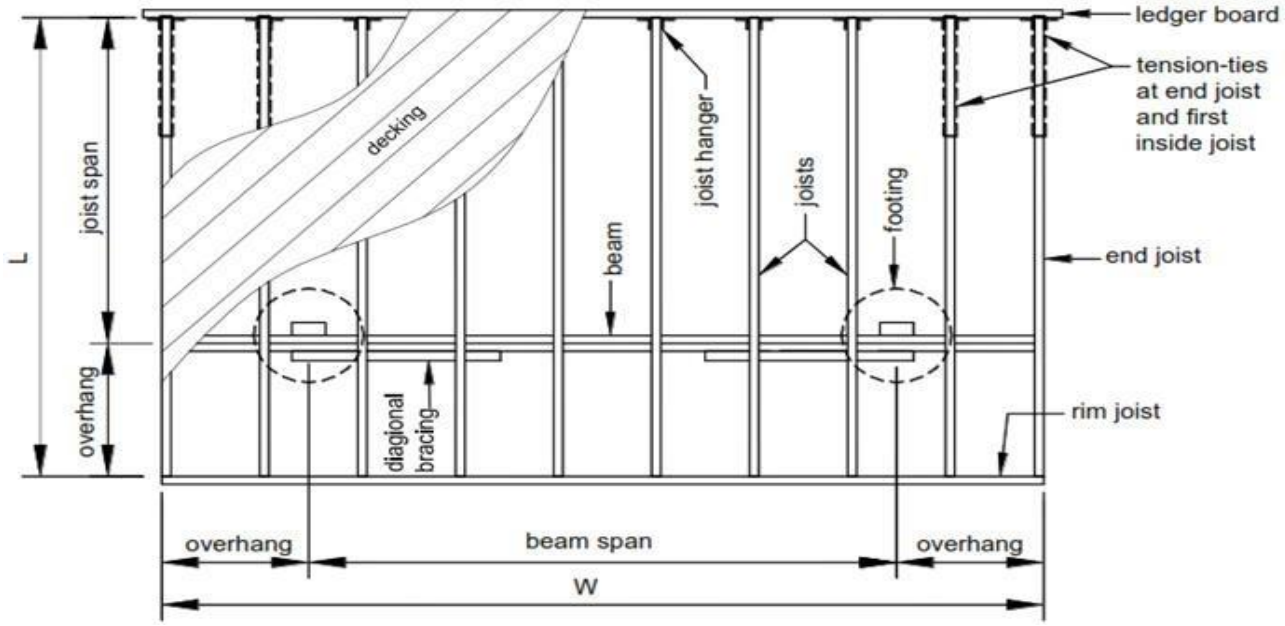
Soil Type		Well	Mod	Poor
Allowable Pressure (Lbs /Sq Ft)		3000	2000	1500
Footing Size (inches)	12	2300	1500	1100
	13	2700	1800	1300
	14	3200	2100	1600
	15	3600	2400	1800
	16	4100	2700	2000
	17	4700	3100	2300
	18	5300	3500	2600
	19	5900	3900	2900
	20	6500	4300	3200
	21	7200	4800	3600
	22	7900	5200	3900
	23	8600	5700	4300
	24	9400	6200	4700

*thickness is ½ diameter of footing

Nelson County Building Department uses 1500 Allowable Pressure (Lbs. / Sq. Ft). and rounds up to next highest number. Example: 2375 lbs. total load rounded up = 2600 per chart = 18" Footing

COMPLETE YOUR DECK

Complete your deck: A framing plan shows a bird's eye view of the joist and beam layout, the location of the deck ledger board, diagonal bracing or hold down devices, posts, footings, and the type, size and spacing of the ledger board fasteners. **Please note that a framing plan drawing shall also be provided along with this deck form.**
If this diagram does not match your deck type, please fill out all applicable boxes and submit with your own drawing.



Size of deck: Length (L) _____ft. Width (W)_____ft. Height above grade _____ft.
Guard rails required? (30" high from grade at 36"out) _____Yes or No
Footings: Width _____ _____ _____ _____ Thickness (8" min) _____in.
Frost Depth: East of Route 151 – 18" deep _____Yes or No West of Route 151 – 24" deep _____Yes or No
Footing Type: Round _____ Square _____ Other: _____
Post size: 4x4 _____ 4x6 _____ 6x6 _____ 8x8 _____ Connection to footing (see pg. 3) A _____ B _____ C _____
Post/Beam Connection: Notched Post _____Yes or No Post Caps _____Yes or No
Does house have siding, stone, or Brick veneer?_____ if other than siding, deck needs to be Free Standing
Deck to be: Attached to house _____ or Free Standing _____ Yes or No
Diagonal Bracing for free-standing decks will be needed
Pressure Treated Ledger size: 2X_____ Ledger Fastener Type_____ Fastener Spacing _____" O.C.
Type of house floor system: Solid Wood Joists_____ I-Joists_____ Floor Trusses_____ House Band Type _____
Deck Post spacing: (Center to Center) _____ _____ _____ _____
Beam: Size _____ Plies _____ Overhang _____ Yes or No If yes, Length (ft. – in)_____ Beam:
Size _____ Plies _____ Overhang _____ Yes or No If yes, Length (ft. – in)_____ Beam:
Size _____ Plies _____ Overhang _____ Yes or No If yes, Length (ft. – in)_____
Joist: Size_____ On Center Spacing _____ Clear Span (ft. – in)_____ Species (SP)_____Other _____
Joist overhangs _____Yes or No, If yes, Overhang length (ft-in)_____
Decking: Type (wood or composite)_____ Size _____ Perpendicular or diagonal _____
Stairs: _____yes or no Handrail required with four or more risers
Is glass within 5 feet of the top, middle, or bottom of the stairs? _____ Yes or No If Yes, window may need protection

I _____sign name_____ **WILL ADHEAR TO THIS DECK PACKET FOR DETAILS AS MY CONSTRUCTION PLAN.**

_____print name _____